

THREE NEW SPECIES OF BORYA Labill. (LILIACEAE)

by

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ABSTRACT

Churchill, D. M. Three new species of *Borya* Labill. (Liliaceae). *Muelleria* 6(1): 1-8 (1985). — *Borya constricta*, *B. laciniata* and *B. mirabilis* are described as new. The first two species are confined to south-western Australia and the third species to Victoria. Plants of each species are in cultivation in the Royal Botanic Gardens, Melbourne.

INTRODUCTION

The genus *Borya* Labill. has been the subject of a long term study which is not yet completed. In compliance with the request for taxonomic treatment of the genus in the 'Flora of Australia', the following taxa are described. Numerical values given in the descriptions refer to the range and, where appropriate, average dimensions for samples of 100 or more measurements.

TAXONOMY

Borya constricta D. M. Churchill, sp., nov., *B. nitidae* Labill. affinis sed folliis puberulis et rigidis, constrictis; bracteis nigris, apicibus acutis, maturitate separatis; pedunculis deciduis.

TYPE: From a plant in cultivation, Royal Botanic Gardens, Melbourne, accession no. 841099, originally from Karalee Rocks (Caroling Rocks), 16 km E. of Yellowdine, Western Australia, 31°16.9' S., 119°48.8' E., 19.i.1970, *D. M. Churchill* 65. HOLOTYPE: 9.vi.1983 (MEL 628557, 1 piece). ISOTYPE: BM. PARATYPE: 4.xi.1981 (CGE); 13.vii.1982 (MEL 628557, 5 pieces); 23.v.1984 (G,K, PERTH); 26.vi.1984 (LD).

B. nitida Labill. var. *sublanosa* F. Muell. ex Baker, *J. Linn Soc. Lond. Bot.* 17:414 (1879). TYPE: *Drummond* 98 (Lectotype (here chosen): CGE. Isolectotypes: G 5821-22, MEL 51048).

[*B. sublanosa* F. Muell. ex Benth., *Fl. Austral.* 7:71 (1878), *nom. pro. syn. sub. B. nitida* Labill.]

Herba caespitosa aestate dormiens perennis 2-25 cm alta 2-40 cm lata. *Caules* erecti vel reclinati simplices vel ramosi atri. *Folia* 24-48 apice surculi cuiusque, linearia rigida 8-20 mm longa 0.6-1.2 mm lata, duobis sulcis abaxialibus stomatophoris usque ad dehiscientiae articulum 0.7-1.0 mm latum extensis; apice pungentia atra facile separata; margine ciliata numquam scabridiuscula. *Foliorum superiorum bases* 0.3-1.0 mm longae fulvae; margine laevi et infra dehiscientiae articulum constricto; sulco stomatophoro absente. *Foliorum inferiorum bases* dilatatae atrobunneae pilis longis tenuibus implexis marginatae. *Pedunculi* 20-36 (av. 28) mm longi 0.75-1.5 plo foliis longiores 0.6-1.0 mm diametro in dimidio, tempore inflorescentiae annua vice exuti, dehiscientiae articulo prope basim semper praediti. *Inflorescentia* obovata-turbinata, 7-10 (av. 9) mm longa 4-10 (av. 6) mm lata; flores 6-12 (av. 9). *Bractee involucales* in duobus verticillis dispositae; exterior erectus bracteis 2-5 (av. 4) foliiformibus quarum longissima 6-11 mm longa est, margine et carina et apice ciliata, ala basali lacerata; interior bracteis 1-4 (av. 2) squamosis, interdum carinis pilosis, apicibus acutis. *Bractee florales* in gemma imbricatae in statu maturo non imbricatae. *Perianthium* hypocrateriforme, lobis anguste ovatis. *Antherae* pallido flavae eglanulatae. *Semina* 0.64-0.74 mm longa, 0.55-0.6 mm lata. *Testa* atra colliculosa.

Herbaceous, tufted, summer-dormant perennial 2-25 cm high, 2-40 cm wide. *Stems* erect or reclining, simple or branched, black. *Leaves* 24-48 per shoot apex, linear, rigid, 8-20 mm long, 0.6-1.2 mm wide, with two abaxial stomata-bearing grooves extending to the abscission joint which is 0.7-1.0 mm wide; apices pungent-pointed, black, easily detached; margins ciliate, never microscabrate. *Upper leaf-base* 0.3-1.0 mm long, pale brown; margin smooth, constricted below the abscission joint; stomatal groove absent or reduced in width. *Lower leaf-base* dilated, blackish-brown; margins with long fine tangled hairs. *Peduncles* 20-36 (av. 28) mm long, 0.75-1.5 times length of leaves, 0.6-1.0 mm diam at mid-length,

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shed annually with inflorescence; abscission joint always present near base. *Inflorescences* obovate-turbinate, 7-10 (av. 9) mm long, 4-10 (av. 6) mm wide at maturity, with 6-12 (av. 9) flowers. *Involucral bracts* in two whorls; outer whorl erect, with 2-5 (av. 4) leaf-like bracts, the outermost bract 6-11 mm long, ciliate at margins, keel and apices and with the basal wing lacerate; inner whorl with 1-4 (av. 2) black scale-like bracts, these sometimes keeled and then ciliate, bract apices acute. *Floral bracts* imbricate in bud, not overlapping at maturity. *Perianth* hypocrateriform; lobes narrowly ovate. *Anthers* pale yellow, eglandular. *Testa* black, colliculose.

SELECTED SPECIMENS EXAMINED:

Western Australia — Cowcowing, "ix. 1904," *M. Koch 1105* (K, MEL 51049, PERTH). Upper Serpentine River, North Bannister, 5.ix.1981, *R. Letouzey 278* (K, P). Karoling, 17.xi.1891, *P. Helms* (MEL 51073). 10 miles E. of Southern Cross, voucher for P74, 7.ix.1974, *G. J. Keighery 22* (PERTH). Newdegate, 14.v.1972, *G. J. Keighery 4252* (PERTH).

DISTRIBUTION:

South-western Australia. Widespread within the region from Wubin to Cowcowing, Manmanning, Bullabulling, south-east to Mt Ragged, west to Cape Riche and north through Pingrup and Lake Grace to Wongan Hills. Outlier populations are found in the Darling Range near Perth, e.g. Sullivan Rocks. This species often occurs at the same locality, but from slightly drier sites, as *Borya sphaerocephala* R.Br. or *Borya laciniata*. At Kuender these three species are associated with one granitic outcrop.

NOTES:

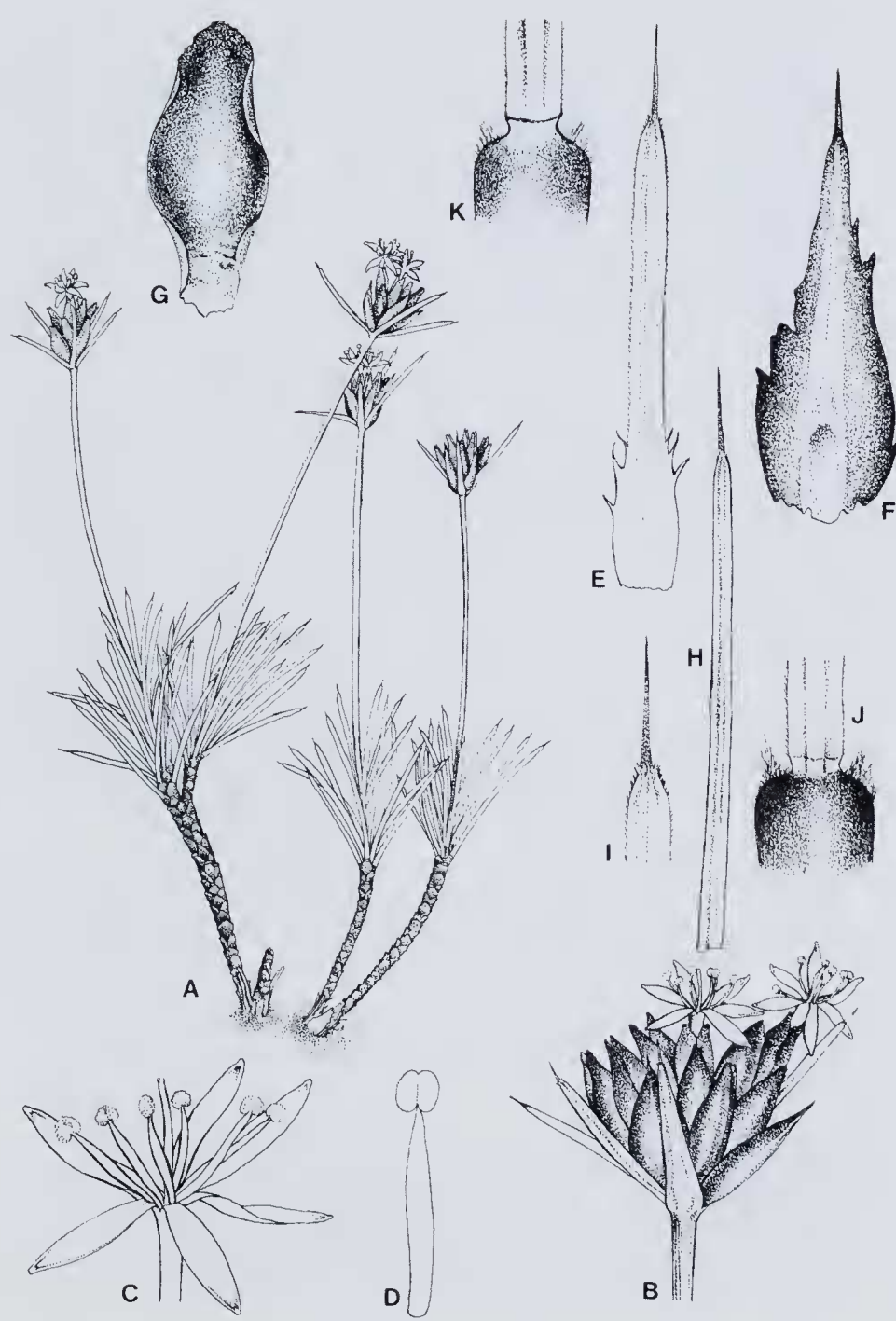
The specific epithet refers to the characteristically constricted margins of the upper leaf-base.

B. constricta may be easily recognised by the deciduous peduncles with an abscission joint near the base of each, the black-brown and constricted leaf-base with finely matted marginal hairs, the ciliate margins of the leaves and the longest bracts, the black pungent leaf apices and the non-overlapping floral bracts in mature inflorescences.

Plants are locally common and associated with granitic outcrops where they grow in the drier, skeletal ferruginous sands of the rock joints. Soil pH at the type locality ranged from 4.4 to 6.2. Flowers appear in late winter and early spring and scapes are shed with seed in late spring or early summer. Plants subjected to water stress while flowering may retain scapes until the following autumn. Leaves turn orange from middle to late spring and the plants become dormant and remain so until a return to low temperatures and autumn rains. While dormant, the leaves remain at ambient relative humidities and can withstand drying to R.H. 0.0% for prolonged periods (several years). Old leaves re-green and lower leaves are shed when dormancy is broken in autumn. Plants of this species are therefore drought resistant and known as "resurrection plants" (See details given under *B. nitida* nom. ambig. in Gaff & Churchill, *Aust. J. Bot.* 24:209-224 (1976)).

In the cultivated plant from which the type specimens were taken dormancy is induced each year through cessation of watering from mid-November to mid-March, i.e. from late spring to late summer, and broken by re-commencement of watering. Inflorescences start development 4 weeks after watering breaks dormancy, flowering occurs after 16 weeks and continues for 4-6 weeks. Perfume, recorded on plants in the field, has never been detected on plants of this species in cultivation.

Fig. 1. *Borya constricta*, a — habit, x 1. b — inflorescence showing 4 outer involucral bracts, 1 inner involucral bract (lower r.h.s.) and spreading floral bracts, x 3. c — flower, x 8. d — stamen with eglandular anther, x 15. e — outermost involucral bract with fine pubescence and lacinate lower wing, x 8. f — inner involucral bract, x 8. g — floral bract opened out, x 6. h — leaf detached at abscission joint, x 4. i — pubescent leaf apex, x 24. j — lower leaf-base (abaxial surface) with wide, darkly pigmented lower segment bearing fine tangled hairs. Note the unusual extension of the stomatal grooves below the abscission joint, x 8. k — lower leaf-base (abaxial surface). Usual shape, the stomatal grooves not extending below the abscission joint, x 8. All except k from living material, Royal Botanic Gardens, Melbourne, cultivation accession no. 832048, grown on from *Churchill 64* (MEL 628554), 50 km peg from Perth on Albany Highway. k from *P.S. Short 1974* and *S.J. Forbes* (MEL 656816) from the type locality.



Borya laciniata D. M. Churchill, sp. nov., *B. scirpoideae* Lindl. affinis sed caulibus tegetes formantibus; foliis arcuatis; bracteis involucales 1-3; perianthio infundibuliformi; testa favulariis confertis praedita, praesertim differt.

Typus: Anderson Rocks, Hyden, Western Australia, 32°10' S., 118°51' E., 13.ix.1982, P.S. Short 1719 (Holotypus: MEL 618324. Isotypus: K, PERTH).

Herbacea tegetem formans aestate dormiens decidua perennis ad 3 cm alta, 8-60 cm lata. *Caulis* prostrati intertexti fulvi. *Folia* 6-18 apice surculi cuiusque, secunda plerumque arcuata interdum recta flexibilia 6-20 mm longa 0.3-0.7 mm lata, duobus sulcis abaxialibus stomatophoris latis pallidis usque ad basem foliorum inferiorum extensis sine strictura ad dehiscientiae articulum 0.25-0.74 mm latum; apice obtusa acuminata vel acicularia fulva vel brunnea, margine laevia ad scabridiuscula. *Foliorum superiorum bases* 0.1-0.5 mm longae virides margine laeves et rectae. *Foliorum inferiorum bases* longae angustae virides, membrana marginali incolorata lobo dilute pigmentiferi laciniato terminata. *Pedunculi* 10-25 (av. 18) mm longi 0.4-0.8 (av. 0.5) mm diametro in dimidio, tempore inflorescentiae annua vice exuti, dehiscientiae articulo prope basim semper praediti. *Inflorescentia* obovoidea 4-6 (av. 5) mm longa 2.5-5.5 (av. 4) mm lata; flores 3-6 (av. 4). *Bracteae involucales* una vel tria prope bracteas florales visae, quarum longissima 3-7 mm longa, ad apices laeve vel scabridiusculae et parum recurvatae, ala basali laevis vel margine modice fissa. *Bracteae florales* cucullatae, in gemma imbricatae in statu maturo non imbricatae, apice obtusae membranaceae parum recurvatae fulvae; pagina laevi vel breviter et pallide carinata. *Perianthium* infundibuliforme, lobis ovatis. *Antherae* armeniaceae, glandula apicali parva alba. *Stigma* rotundatum ad parum triangulatum in statu vivo, subtiliter papillatum. *Testa* favulariis confertis praedita.

Herbaceous, mat-forming, summer-dormant, deciduous perennial to 3 cm high, 8-60 cm wide. *Stems* prostrate, interlocking, pale brown. *Leaves* 6-18 per shoot apex, secund, usually arcuate, sometimes straight, flexible, linear, 6-20 mm long, 0.3-0.7 mm wide, with two broad pale abaxial stomata-bearing grooves which extend to the lower leaf base; leaves without constriction at the abscission joint which is 0.25-0.74 mm wide; apices blunt, acuminate or acicular, pale to dark brown; margins smooth to micro-scabrate. *Upper leaf-base* 0.1-0.5 mm long, pale green; margins smooth, straight. *Lower leaf-base* long and narrow, pale green with a colourless marginal membrane terminated by a faintly pigmented lacinate lobe or lobes. *Peduncles* 10-25 (av. 18) mm long, 0.4-0.8 (av. 0.5) mm diam. at mid-length, shed with inflorescence annually; abscission joint always present near base. *Inflorescences* obovoid, 4-6 (av. 5) mm long, 2.5-5.5 (av. 4) mm wide, with 3-6 (av. 4) flowers. *Involucral bracts* 1 to 3, the longest 3-7 mm long, smooth or microscabrate towards the apices and often slightly recurved, with basal wing smooth or simply notched at the margins. *Floral bracts* cucullate, imbricate in bud, not overlapping at maturity; apices obtuse, membranous, slightly recurved, light brown; surface smooth or with short pale central keel. *Perianth* infundibuliform; lobes ovate. *Anthers* orange-yellow, with small white apical gland. *Stigma* rounded to slightly triangular when fresh, finely papillate. *Testa* with crowded favularia.

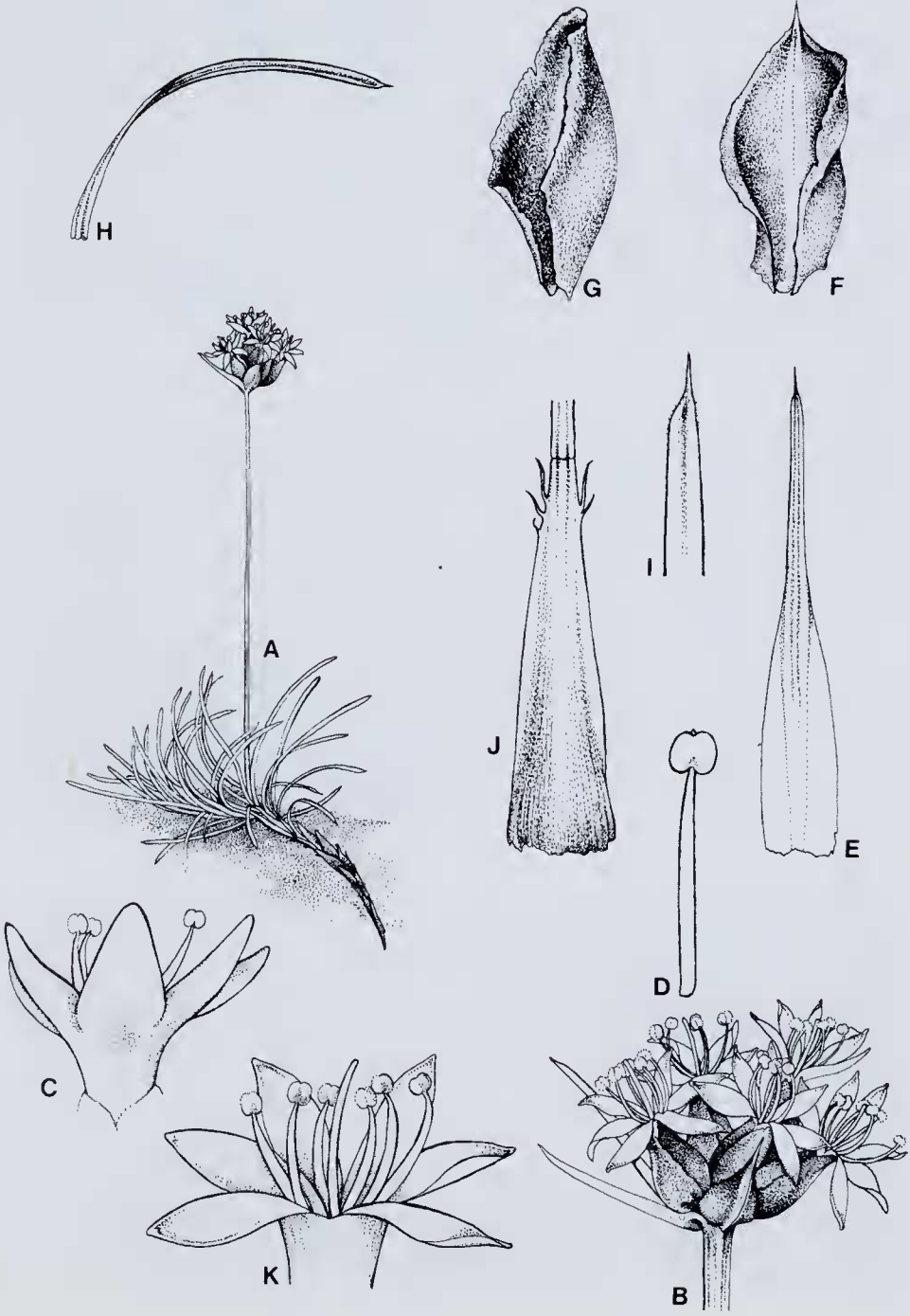
SELECTED SPECIMENS EXAMINED:

Western Australia — Swan River, vii.1848, *J. Drummond 341* (CGE, G5821-20, MEL 51038). Manmanning, 30°51' S., 117°12' E., 1978, *A. George s.n.* (MEL 589547; Roy. Bot. Gard. Melbourne cult. acc. no. 781098). Kuender, 32°57.2' S., 118°32.4' E., 17.xi.1983, *D.M. Churchill 50* (MEL 665084; Roy. Bot. Gard. Melbourne cult. acc. no. 832064). 4.5 miles E. of Highbury, 33°05' S., 117°19' E., 29.ix.1971, *A. George 11062* (MEL, PERTH). Tutanning Reserve, 18.viii.1975, *G.J. Keighery 301* (PERTH).

DISTRIBUTION:

South-western Australia. Badgingarra, Watheroo, Wongan Hills, Manmanning, Tammin, Hyden, Ongerup, Borden, Highbury, east of Pingelly, Goomalling.

Fig. 2. *Borya laciniata*. a — habit, x 1. b — inflorescence showing 3 involucre bracts and spreading floral bracts, x 3. c — perianth, x 6. d — stamen with glandular anther, x 12. e — longest involucre bract, x 8. f — shortest involucre bract, x 8. g — floral bract x 8. h — leaf detached at abscission joint and straighter than from many native habitats, x 2. i — leaf apex with microscabrate, x 8. j — leaf-base (abaxial surface) with abscission joint, long tapering margins to stem sheath and lacinate fringe, x 4. k — perianth, x 6. All except d and k from living material, Royal Botanic Gardens, Melbourne, cultivation accession no. 781098, grown on from *A. George s.n. B* (MEL 589547), Manmanning. d from holotype. k from *G. Keighery 6597* (PERTH).



NOTES:

The specific epithet refers to the laciniate lobes of the upper leaf margins. This character is variable and ranges from smooth entire margins to highly dissected lobes. In most specimens at least some leaf-bases have simple lobes with terminal fringe.

B. laciniata may be confused with *Borya scirpoidea* Lindl. because there is an overlap in some characters. However the prostrate mat habit, the three or fewer involucrel bracts, the second arrangement of leaves that are rarely without a laciniate lobed base, the wide perianth tube with short broad segments and the distinctively favulariate patterned seed characterise the species. *B. scirpoidea* in contrast has stems below ground level, ascending tufted leaves with radially symmetrical placement and with the leaf-bases rarely lobed, the perianth tube narrow, the seed smoothly undulate with fine transverse striae and, in addition, the floral bracts are usually imbricate, even at maturity.

Plants are found on soils ranging from skeletal granitic sands, loamy sands, sandy clay loams, to swampy clay soils. Most soils are subject to periodic flooding or winter waterlogging. Soil pH under plants at Kuender was 6.2. Associated larger trees and shrubs include *Eucalyptus loxophleba*, *E. occidentalis*, *E. wandoo*, *Acacia acuminata* or *Casuarina campestris*. Some associated herbs, such as *Hyalochlamys globifer*, indicate saline soils.

Flowers appear in late winter and early spring, and scapes are shed with seed and leaves in late spring or early summer, leaving dormant stems. New leaves are produced each season and the plants are "drought avoiders".

Borya mirabilis D.M. Churchill, sp. nov., ab omnibus speciebus praecedentibus manifeste distincta, bracteis quam bracteolis brevioribus; placentatione contorta.

TYPUS: Mackey's Peak, Wonderland Range, The Grampians, Victoria, 37°11' S., 142°31' E., 13.ix.1982, D.M. Churchill 66 (Holotypus: MEL 628551. Isotypus: G, K, LD).

Herbacea caespitosa aestate dormiens perennis, 3-15 cm alta 3-10 cm lata. Caulis erecti vel reclinati simplices vel ramosi brunnei. Folia 25-45 apice surculi cuiusque, linearia flexibilia 10-16 mm longa 0.5-0.7 lata, duobus sulcis abaxialibus stomatophoris usque ad basem foliorum superiorum extensis strictura parva vel nulla ad dehiscentiae articulum 0.5-0.8 mm latum; apice obtusa acuminata brunnea, margine laevia glabra. Foliorum superiorum bases 0.1-0.4 mm longae, margine laeves fulvae decrescentes. Foliorum inferiorum bases ad vaginam gradatim dilatatae, fulvae ad brunneas, pilis tenuibus emplexis marginatae. Pedunculi 30-70 (av. 50) mm longi, 0.6-1.1 (av. 0.8) mm diametro in dimidio, aliquot annos in caule retenti, dehiscentiae articulo nullo praediti. Inflorescentia ellipsoidea-obovata 6-10 (av. 8) mm longa, 4-8 (av. 6) mm lata; flores 4-12 (av. 8-9). Bractee involucreales in duobus verticillis dispositae: exterior divergens bracteis 3-6 (av. 4) foliiformibus quarum longissima 7-13 (av. 10) mm longa ad apicem glabra, ala basali laevis; interior bracteis 0-10 (av. 4) brunneis squamosis apice acerosis. Bractee florales in gemma imbricatae in statu maturo non imbricatae, bracteolis breviores, fulvae, apice mucronatae; pagina laevis, costa elevata. Perianthium hypocrateriforme, lobis anguste ovatis. Antherae flavae apice glandulosae. Ovarium placentatione maxime contorta. Semina non visa. Testa ovulorum colliculosa.

Herbaceous, tufted, summer-dormant perennial 3-15 cm high, 3-20 cm wide. Stems erect or reclining, simple or branched, dark brown. Leaves 25-45 per shoot apex, linear, flexible, 10-16 mm long, 0.5-0.7 mm wide, with two abaxial stomata-bearing grooves which extend to the upper leaf-base and with little or no constriction at the abscission joint which is 0.5-0.8 mm wide; apices obtuse with acuminate point, brown; margins smooth and glabrous. Upper leaf-bases 0.1-0.4 mm long; margins smooth, pale brown, tapering. Lower leaf-bases widening to a sheath, light to dark brown; margins with fine tangled hairs. Peduncles 30-70 (av. 50) mm long, 0.6-1.1 (av. 0.8) mm diam. at mid-length, retained on stem for several years; abscission joint absent. Inflorescences ellipsoidal-obovate, 6-10 (av. 8) mm long, 4-8 (av. 6) mm wide, with 4-12 (av. 8-9) flowers. Involucrel bracts in two whorls: outer whorl divergent, with 3-6 (av. 4) leaf-like bracts, the outermost 7-13 (av. 10) mm long, glabrous to the apex and with the basal wing smooth; inner whorl with 0-10 (av. 4) brown scale-like bracts with acerose apices. Floral bracts imbricate in the bud, not overlapping at maturity, shorter than bracteoles, light brown; apices mucronate; surface smooth with central raised midrib. Perianth hypocrateriform; lobes narrow-ovate. Anthers yellow; apices glandular. Ovary with highly contorted placentation. Testa of ovules colliculose.

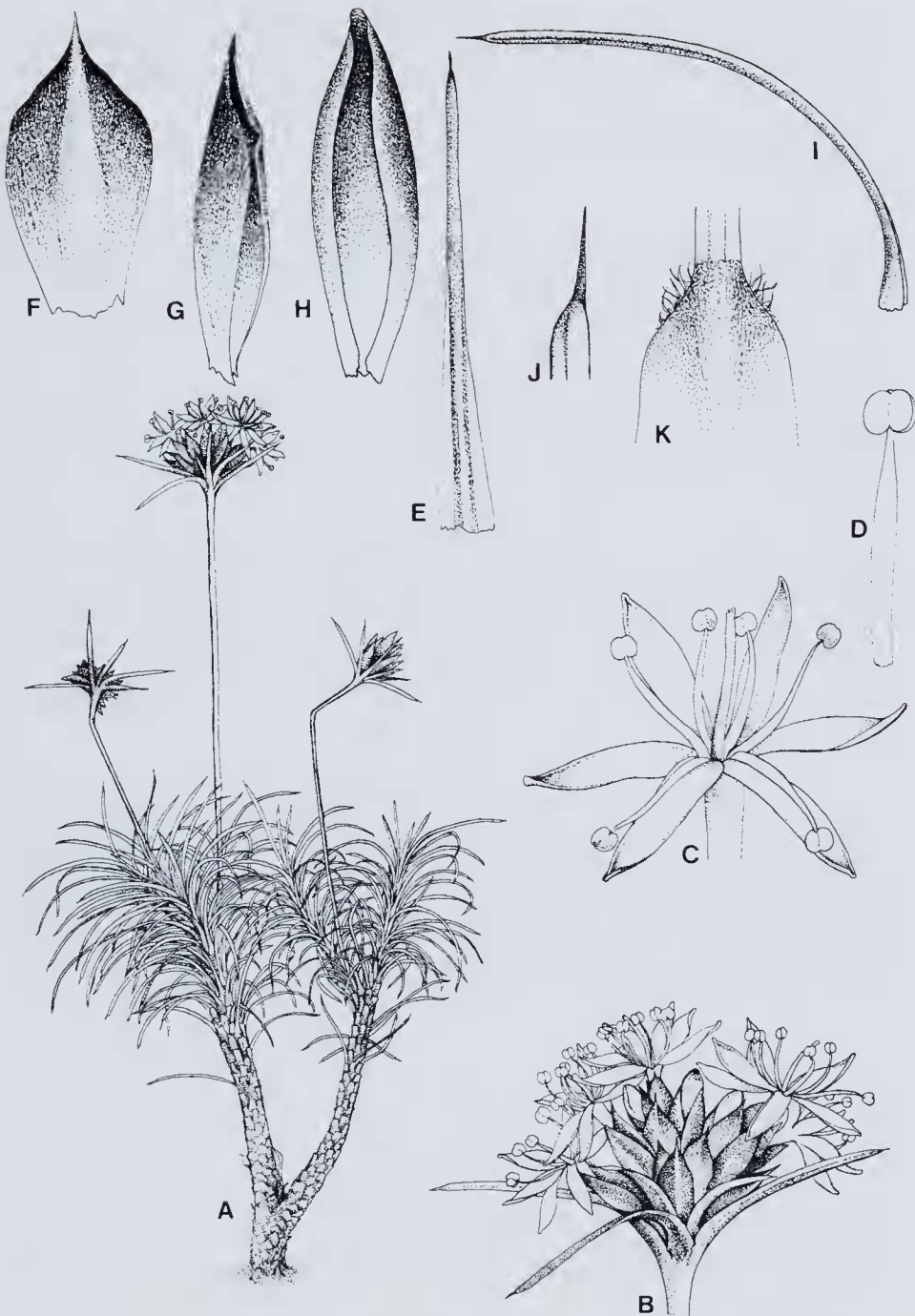


Fig. 3. *Borya mirabilis*. a — habit x 1. b — inflorescence showing outer and inner involucre bracts and spreading floral bracts, x 2. c — perianth, x 4. d — stamen with glandular anther, x 8. e — longest involucre bract, x 4. f — inner involucre bract, x 8. g — floral bract, x 8. h — floral bracteole, x 8. i — leaf with basal sheath, x 3. j — leaf apex, x 8. k — lower leaf-base, broadly wedged-shaped with fine tangled hairs, x 8. All from living material, Royal Botanic Gardens, Melbourne, cultivation accession no. 841100, grown on from Churchill 67 (MEL 628553), Mackey's Peak.

SELECTED SPECIMENS EXAMINED:

Victoria (Grampians) — Wonderland Peak, x.1924, C.W. Dalton (MEL 51089). Summit of Mackey's Peak, 30.x.1952, R. Melville and P.F. Morris, led by L.C. Dalton (MEL 51090). On steep slopes and sandstone rocks of Mackey's Peak, 30.x.1952, R. Melville 1853, P. Morris, C. D'Alton & R. Warry (MEL 51013).

DISTRIBUTION:

The Grampians, Victoria. Confined to one locality where there are a few plants within a few square metres on Mackey's Peak.

NOTES:

The specific epithet refers to the remarkably isolated occurrence of this species in the Wonderland Range of The Grampians. It is also remarkable that it does not appear to set seed and must therefore depend for its precarious survival on vegetative reproduction and absence of fire. The species must be regarded as being on the verge of extinction.

B. mirabilis is unlikely to be confused with any other species. The bracteoles are longer than the floral bracts and this alone distinguishes it.

The soil pH under these plants is 5.1. Flowers appear in spring, in October and early November. Leaves turn orange in December and plants stay dormant until the autumn. The species is "drought resistant".

ACKNOWLEDGEMENTS

I am most grateful to each of the following people who spared no effort to collect specimens from isolated nominated areas and to introduce plants for study into cultivation in the Royal Botanic Gardens: A. Baird, J. and W. Brown, P. Christensen, S. and C. Churchill, B. Conn, S. Forbes, D. Gaff, A. George, J. Laidlaw, N. Marchant, T. Maughan, G. McCraith, J. Ross, P. Short, R. Tudor, W. Worboys and M. Westera. Anita Podwyszynski, Botanical Illustrator of the Royal Botanic Gardens and National Herbarium, Melbourne, provided the illustrations. The directors and curators of collections of the following herbaria kindly provided loans of *Borya* specimens: BM, BRIS, CANB, CGE, G, LD and PERTH.

Dr Michael Crisp, while Australian Botanical Liaison Officer at Kew Herbarium undertook the detailed examination of unnamed, superficially similar, test specimens, selected from all south-western Australian *Borya* taxa and anatomical drawings for comparison with Labillardiere's type material of *B. nitida* in Florence. He also drew my attention to type material (!) in Geneva. Mr Alex George generously supplied colour transparencies of the holotype and notes of Labillardiere that relate to *B. nitida*. Drs John Green, Terry McFarlane and Neville Marchant of the Western Australian Herbarium and Mr Richard Burchnell are also thanked for their generous time and assistance in many supportive ways.